IN THE CLAIMS

1. (currently amended) Apparatus ~~An integrated device~~ for sensing a ~~external~~ magnetic fields due to a current to be measured comprising:

a first device comprising planar magnetic field sensing means having at least a first magnetic field sensing element, a second magnetic field sensing element, and an output terminating region;

a second device comprising planar magnetic field sensing means having at least a first magnetic field sensing element, a second magnetic field sensing element, and an output terminating region;

means for supporting said first device on a side of a conductor carrying a current to be measured and for supporting said second device on an opposite side of said conductor, with said first device and said second device lying in a common plane perpendicular to said conductor;

bias current means for providing a bias field for setting a direction of magnetization in said first magnetic field sensing elements and in said second magnetic field sensing elements in a first direction with said bias field being sufficient to initially align magnetization in said first magnetic field sensing elements and said second magnetic field sensing elements; and,

means for determining a combination of an output of said first device and an output of said second device with said combination representing said current to be measured and said device having a level of sensitivity related to a level of said bias current.

~~a conductor carrying a bias current for providing a bias field for setting a direction of magnetization in said first magnetic field sensing element and in said second magnetic field sensing element in a first direction with said bias field being sufficient to initially align magnetization in said first magnetic field sensing element and said second magnetic field sensing element; and,~~

~~said device having a level of sensitivity to magnetic field components in a direction perpendicular to said first direction and providing an output at said output terminating region with said level of sensitivity being related to a level of said bias current.~~

2. (currently amended) The apparatus ~~device~~ of claim 1 wherein said planar magnetic field sensing means comprises four magnetoresistive elements forming four legs of a Wheatstone bridge with opposite legs of said Wheatstone bridge having current flow in the same direction.

3. (currently amended) The apparatus ~~device~~ of claim 1 wherein said magnetic field sensing elements comprise elongated strips having a pattern of metal overlaid on said strips to alter the direction of current flow through said strips.

4. (currently amended) The apparatus ~~device~~ of claim 1 wherein said bias current means comprises a conductor ~~carrying a bias current is~~ in the form of a coil comprising at least one turn.

Claims 5-6 (cancelled)

7. (currently amended) The apparatus ~~device~~ of claim 1 ~~6~~ further comprising means for varying a level of said bias current.

8. (currently amended) The apparatus ~~device~~ of claim 1 ~~7~~ wherein said output of said first device ~~of claim 1~~ and said output of said second device are connected to provide an output representing a difference between said output of said first device ~~of claim 1~~ and said output of said second device.

9. (currently amended) The apparatus ~~device~~ of claim 1 ~~7~~ wherein said means for supporting said first device ~~of claim 1~~ on a first side of a conductor carrying a current to be measured and for supporting said second device on an opposite side of said conductor comprises a housing having a first leg supporting said first device ~~of claim 1~~ and a second leg supporting said second device.

10. (currently amended) The apparatus ~~device~~ of claim 9 further comprising a nonmagnetic deformable resilient material for maintaining said first device ~~of claim 1~~ and said second device equally spaced from said conductor carrying a current to be measured.

11. (currently amended) The apparatus ~~device~~ of claim 10 wherein said material is located between said first leg and said second leg and offers sufficient resistance to deformation to keep said first device ~~of claim 1~~ and said second device equally spaced from said conductor carrying a current to be measured.

12. (currently amended) Apparatus ~~An integrated device~~ for sensing a ~~external~~ magnetic fields due to a current to be measured comprising:

a first magnetic field sensing means and a second magnetic field sensing means with each of said first and second means having first, second, third, and fourth magnetoresistive elements and an output terminating region, each of said magnetoresistive elements having first and second terminating regions, said first magnetoresistive element first terminating region being connected to said third magnetoresistive element first terminating region, said first magnetoresistive second terminating region being connected to said second magnetoresistive element second terminating region, said third magnetoresistive element second terminating region being connected to said fourth magnetoresistive element second terminating region and said second magnetoresistive element first terminating region connected to said fourth magnetoresistive element first terminating region;

said first magnetic field sensing means and said second magnetic field sensing means each having an integral coil carrying a bias current, said current providing a magnetic field in a first direction and establishing an initial direction of magnetization in said first, second, third and fourth magnetoresistive elements in said first direction, ~~and;~~

means for supporting said said first magnetic field sensing means on a side of a conductor carrying a current to be measured and for supporting said second magnetic field sensing means on an opposite side of said conductor, with said first magnetic field sensing means and said second magnetic field sensing means lying in a common plane perpendicular to said conductor;

means for determining a combination of an output of said first magnetic field sensing means and an output of said second magnetic field sensing means with said combination being representative of said current to be measured, and;

said ~~device~~ apparatus having a level of sensitivity to magnetic field components in a direction perpendicular to said first direction with said level of sensitivity being related to a level of said bias current.

13. (currently amended) The apparatus ~~device~~ of claim 12 wherein said magnetoresistive elements have a herringbone shape.

14. (currently amended) The apparatus ~~device~~ of claim 12 wherein said magnetoresistive elements comprise barber pole biasing.

15. (cancelled)

16. (currently amended) The apparatus ~~device~~ of claim 12 ~~15~~ wherein said ~~planar~~ magnetic field sensing means comprises four meander type magnetoresistive elements forming four legs of a Wheatstone bridge with opposite legs of said Wheatstone bridge having current flow in the same direction.

17. (currently amended) The apparatus ~~device~~ of claim 12 ~~15~~ wherein said magnetic field sensing elements comprise elongated strips having a pattern of metal overlaid on said strips to alter the direction of current flow through said strips. .

18. (currently amended) The apparatus ~~device~~ of claim 12 ~~15~~ wherein ~~said~~ an output of said first magnetic field sensing means and an output of said second magnetic field sensing means ~~said device of claim 12 and said output of said second device~~ are connected to provide an output representing a difference between said output of said first magnetic field sensing means and said output of said second magnetic field sensing means.

19. (currently amended) The apparatus ~~device~~ of claim 18 ~~15~~ wherein said means for determining ~~a~~ said combination ~~of an output of said device of claim 12 and an output of said second device~~ comprises processor means.

20. (re-presented) Apparatus for measuring current within a conductor comprising:

a first planar magnetic field sensor having magnetoresistive sensing elements, an integral conductor carrying a bias current and an output terminating region, said bias current initially aligning magnetization of said magnetoresistive elements in a first direction;

a second planar magnetic field sensor having magnetoresistive sensing elements, an integral conductor carrying a bias current, and an output terminating region, said bias current initially aligning magnetization of said magnetoresistive elements in a first direction;

a housing positioning said first magnetic field sensor on a first side of said conductor and positioning said second magnetic field sensor on an opposite side of said conductor with said first planar sensor and said second planar sensor lying in a common plane perpendicular to said conductor;

means for determining a combination of an output of said first magnetic field sensor and an output of said second magnetic field sensor with said combination being representative of said current to be measured.

21. (re-presented) Apparatus of claim 20 wherein said first magnetic field sensor and said second magnetic field sensor comprise four meander type magnetoresistive elements forming four legs of a Wheatstone bridge with opposite legs of said Wheatstone bridge having current flow in the same direction.

22. (re-presented) Apparatus of claim 20 wherein said first magnetic field sensor and said second magnetic field sensor are connected so as to provide an output representative of a difference between an output of said first magnetic field sensor and an output of said second magnetic field sensor.

23. (re-presented) Apparatus of claim 20 further comprising means for varying said bias current in said first magnetic field sensor and said second magnetic field sensor.

24. (re-presented) Apparatus of claim 20 wherein said housing comprises a first leg and a second leg extending on opposite sides of said conductor.

25. (re-presented) Apparatus of claim 24 further comprising a non-magnetic deformable resilient material located between said first leg and said second leg.

26. (re-presented) Apparatus for measuring current within a conductor comprising:

a first magnetic field sensor;

a second magnetic field sensor

a housing positioning said first magnetic field sensor on a first side of said conductor and positioning said second magnetic field sensor on an opposite side of said conductor with said first sensor and said second sensor lying in a common plane;

means for determining a combination of an output of said first magnetic field sensor and an output of said second magnetic field sensor with said combination being representative of said current to be measured.

27. (re-presented) Apparatus of claim 26 wherein said first magnetic field sensor and said second magnetic field sensor are Hall type elements.

28. (re-presented) Apparatus of claim 26 wherein said first magnetic field sensor and said second magnetic field sensor comprise magnetoresistive elements.

29. (re-presented) A method of measuring a current in a conductor comprising the following steps:

providing a first planar magnetoresistive magnetic field sensor having an integral coil for providing a bias field;

providing a second planar magnetoresistive magnetic field sensor having an integral coil for providing a bias field;

positioning said first magnetic field sensor on a first side of said conductor and said second magnetic field sensor on an opposite side of said conductor;

applying a current to said integral coils;

determining an output of said first magnetic field sensor and said second magnetic field sensor; and

calculating a current in said conductor.

30. (re-presented) The method of claim 29 wherein the step of positioning comprises the step of placing the magnetic field sensors in a common plane perpendicular to said conductor.

31. (re-presented) The method of claim 29 wherein the step of calculating a current in said conductor includes the step of providing a microprocessor for calculating.

32. (re-presented) The method of claim 29 wherein the step of applying a current to said integral coils includes the step of duty cycling said current to said integral coils.